SGS-THOMSON MICROELECTRONICS

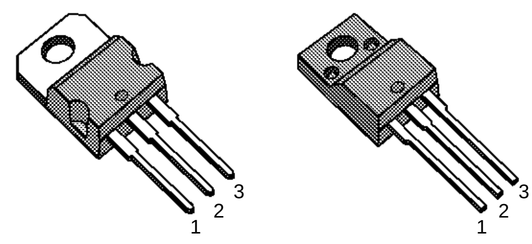
STP6N25
STP6N25FI

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTORS

PRELIMINARY DATA

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP6N25	250 V	< 1 Ω	6 A
STP6N25FI	250 V	< 1 Ω	4 A

- TYPICAL $R_{DS(on)}$ = 0.7 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- APPLICATION ORIENTED CHARACTERIZATION

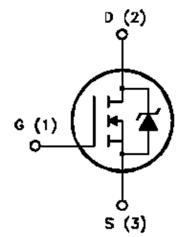


TO-220 ISOWATT220

APPLICATIONS

- HIGH SPEED SWITCHING
- UNINTERRUPTIBLE POWER SUPPLY (UPS)
- MOTOR CONTROL, AUDIO AMPLIFIERS
- INDUSTRIAL ACTUATORS
- DC-DC & DC-AC CONVERTERS FOR TELECOM, INDUSTRIAL AND CONSUMER ENVIRONMENT
- PARTICULARLY SUITABLE FOR ELECTRONIC FLUORESCENT LAMP BALLASTS

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP6N25	STP6N25FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	250		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	250		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 ^{o}C	6	4	A
I_D	Drain Current (continuous) at T_c = 100 ^{o}C	4	2.6	A
I_{DM}(•)	Drain Current (pulsed)	24	24	A
P_{tot}	Total Dissipation at T_c = 25 ^{o}C	70	35	W
	Derating Factor	0.56	0.28	W/^{o}C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	
T_{stg}	Storage Temperature	-65 to 150		^{o}C
T_j	Max. Operating Junction Temperature	150		^{o}C

(•) Pulse width limited by safe operating area

THERMAL DATA

		TO-220	ISOWATT220	
$R_{thj\text{-}case}$	Thermal Resistance Junction-case Max	1.79	3.57	$^oC/W$
$R_{thj\text{-}amb}$ $R_{thc\text{-}sink}$ T_l	Thermal Resistance Junction-ambient Max Thermal Resistance Case-sink Typ Maximum Lead Temperature For Soldering Purpose	62.5 0.5 300		$^oC/W$ $^oC/W$ ^oC

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	6	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25\ ^oC$, $I_D = I_{AR}$, $V_{DD} = 50$ V)	40	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	10	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive ($T_c = 100\ ^oC$, pulse width limited by T_j max, $\delta < 1\%$)	4	A

ELECTRICAL CHARACTERISTICS ($T_{case} = 25\ ^oC$ unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	$I_D = 250\ \mu A$ $V_{GS} = 0$	250			V
I_{DSS}	Zero Gate Voltage Drain Current ($V_{GS} = 0$)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 $T_c = 125\ ^oC$			250 1000	μA μA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 20$ V			± 100	nA

ON (∗)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ $I_D = 250\ \mu A$	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10V$ $I_D = 3$ A $V_{GS} = 10V$ $I_D = 3$ A $T_c = 100^oC$		0.7	1 2	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10$ V	6			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (∗)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 3$ A	1.5	3.5		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{DS} = 25$ V f = 1 MHz $V_{GS} = 0$		500 85 15	700 120 30	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 125 V I_D = 3 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		35 70	50 100	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 200 V I_D = 6 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		220		A/μs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 200 V I_D = 6 A V_{GS} = 10 V		20 6 7	30	nC nC nC

SWITCHING OFF

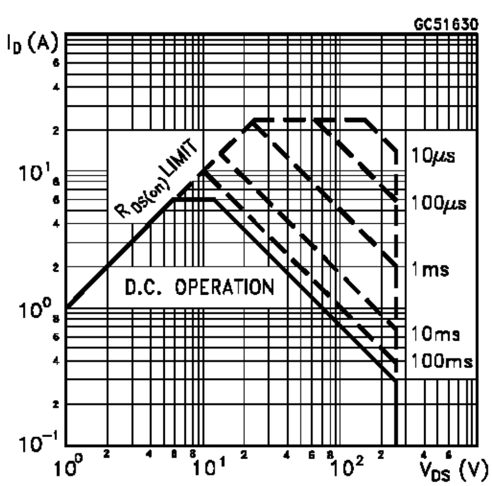
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 200 V I_D = 6 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		40 25 70	60 35 100	ns ns ns

SOURCE DRAIN DIODE

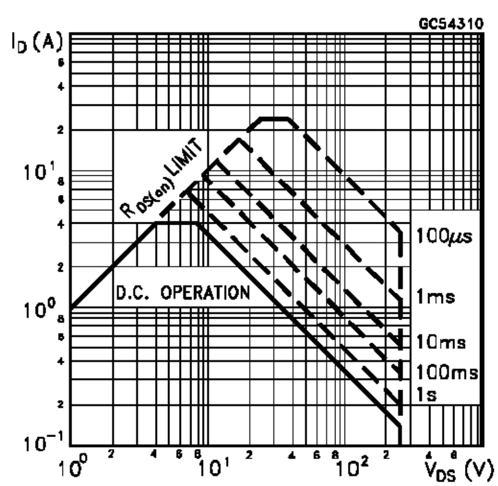
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				6 24	A A
V_{SD} (∗)	Forward On Voltage	I_{SD} = 6 A V_{GS} = 0			1.5	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 6 A di/dt = 100 A/μs V_{DD} = 100 V T_j = 150 °C (see test circuit, figure 5)		180 1.1 12		ns μC A

(∗) Pulsed: Pulse duration = 300 μs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

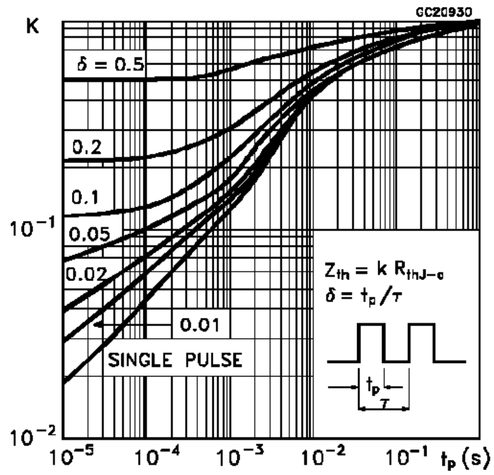
Safe Operating Areas For TO-220



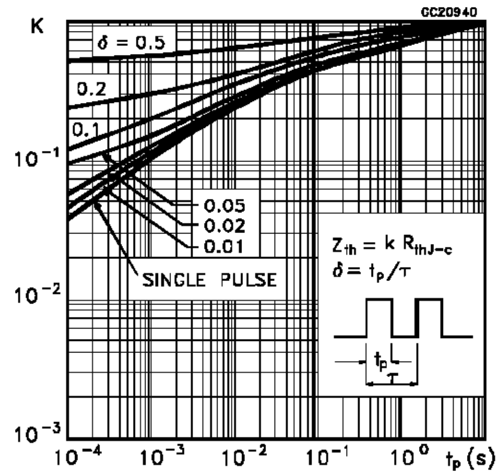
Safe Operating Areas For ISOWATT220



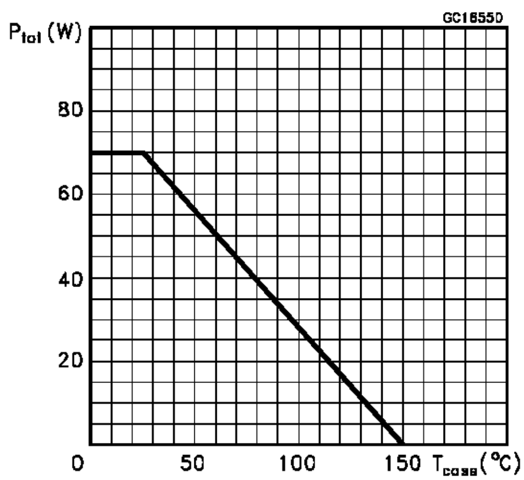
Thermal Impedeance For TO-220



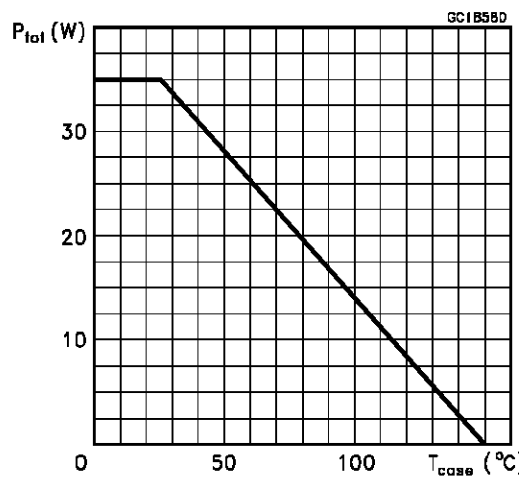
Thermal Impedance For ISOWATT220



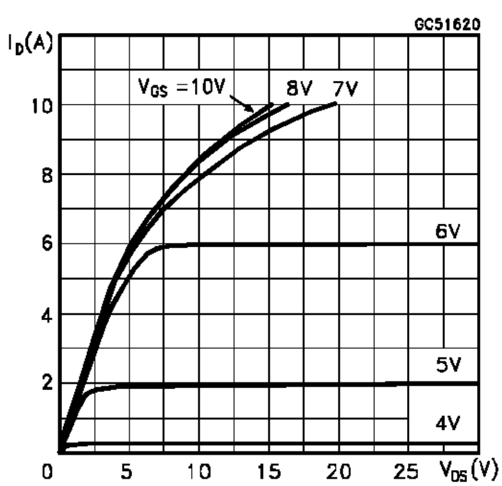
Derating Curve For TO-220



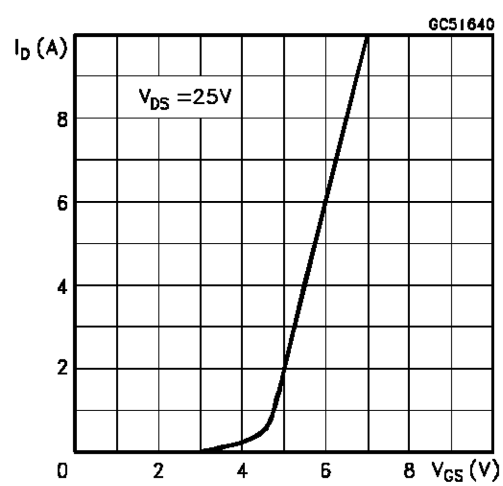
Derating Curve For ISOWATT220



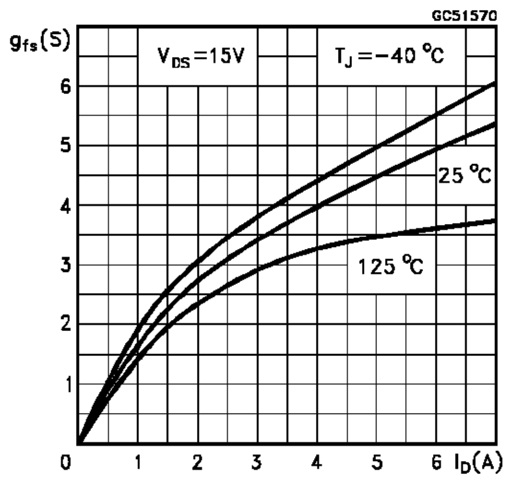
Output Characteristics



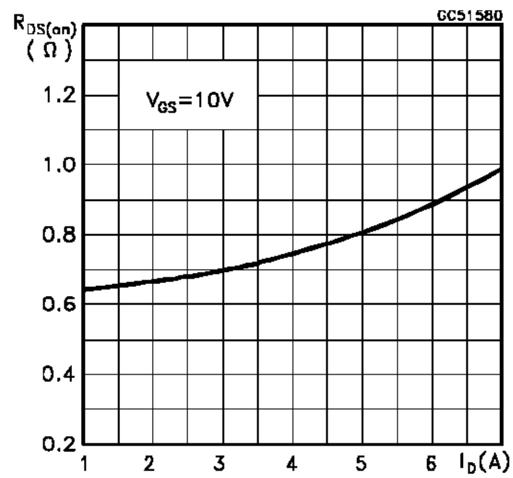
Transfer Characteristics



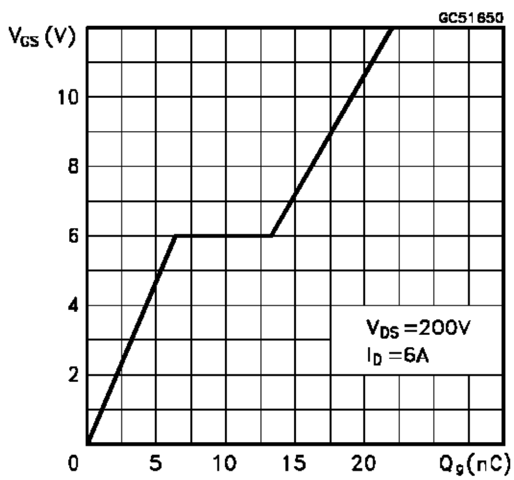
Transconductance



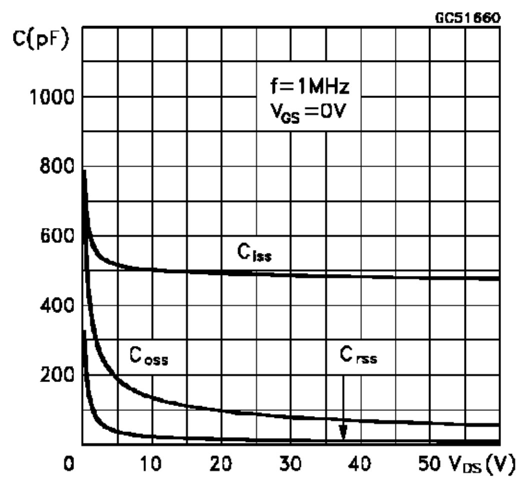
Static Drain-source On Resistance



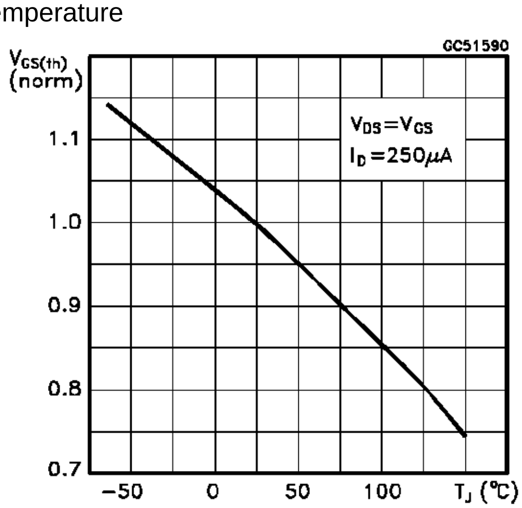
Gate Charge vs Gate-source Voltage



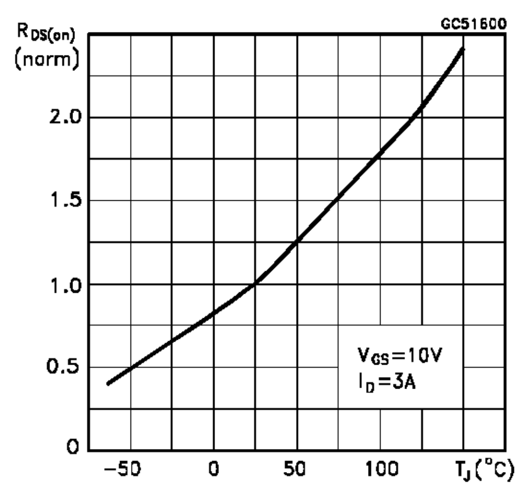
Capacitance Variations



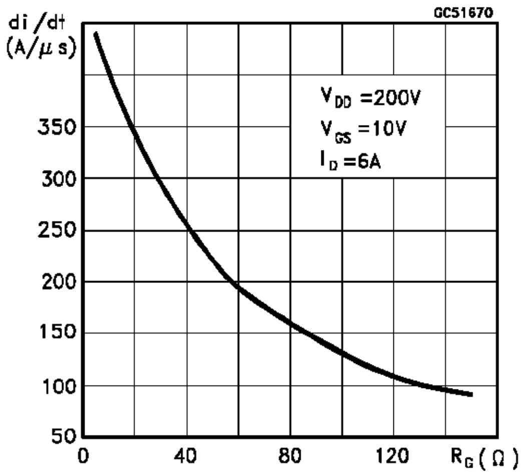
Normalized Gate Threshold Voltage vs Temperature



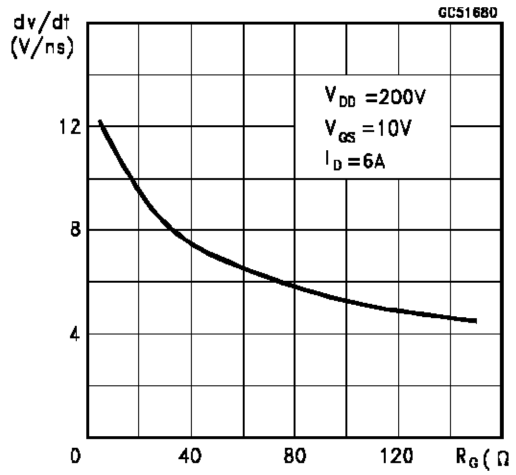
Normalized On Resistance vs Temperature



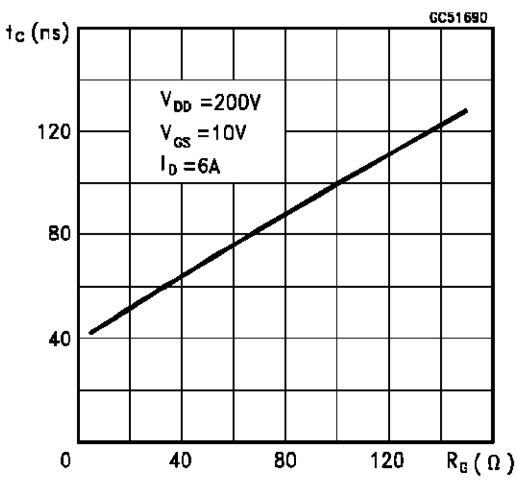
Turn-on Current Slope



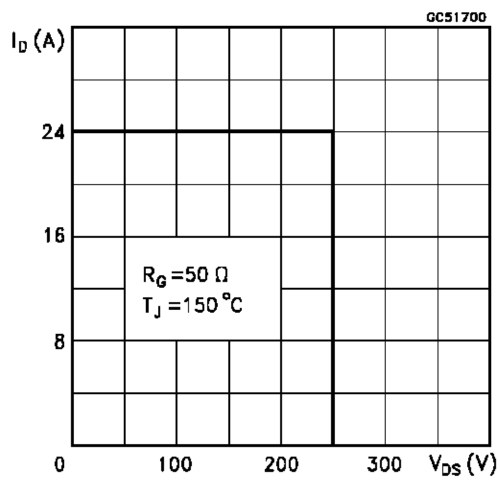
Turn-off Drain-source Voltage Slope



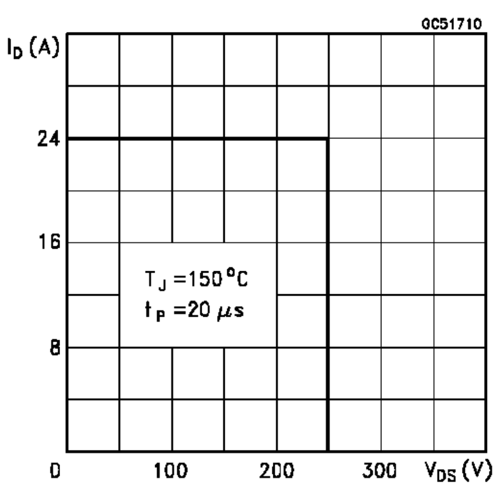
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

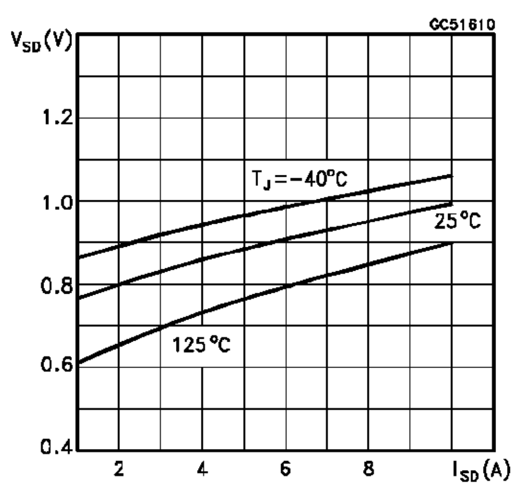


Fig. 1: Unclamped Inductive Load Test Circuits

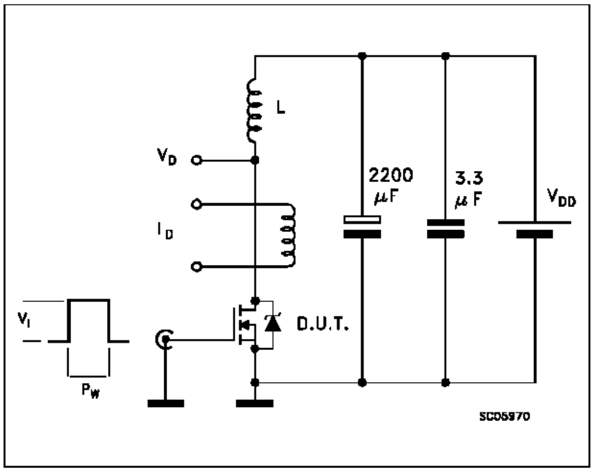


Fig. 2: Unclamped Inductive Waveforms

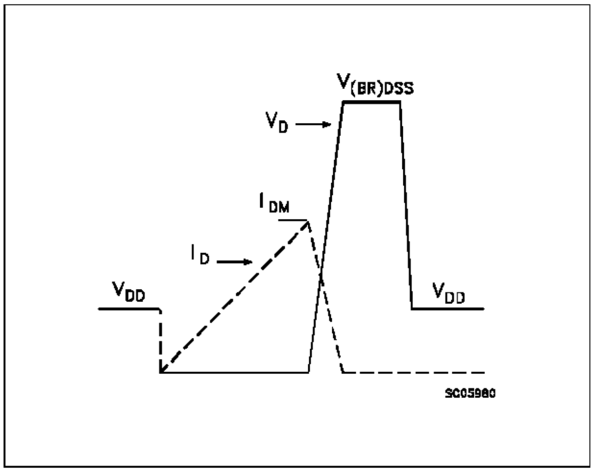


Fig. 3: Switching Times Test Circuits For Resistive Load

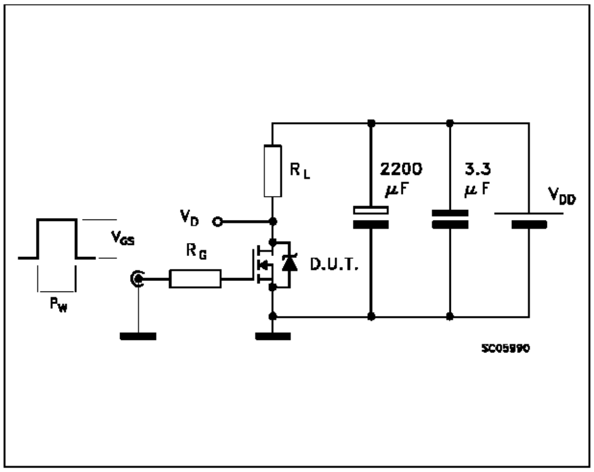


Fig. 4: Gate Charge Test Circuit

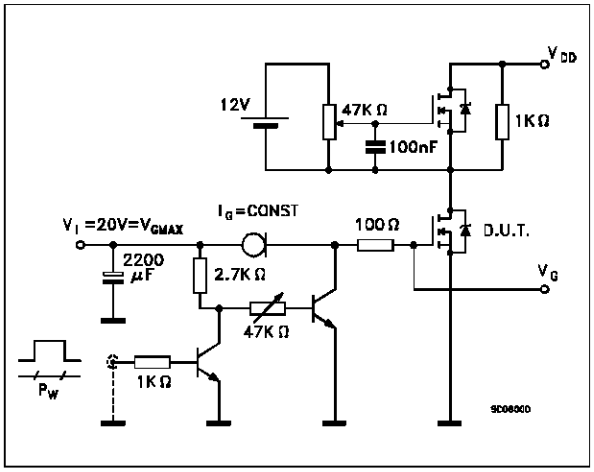
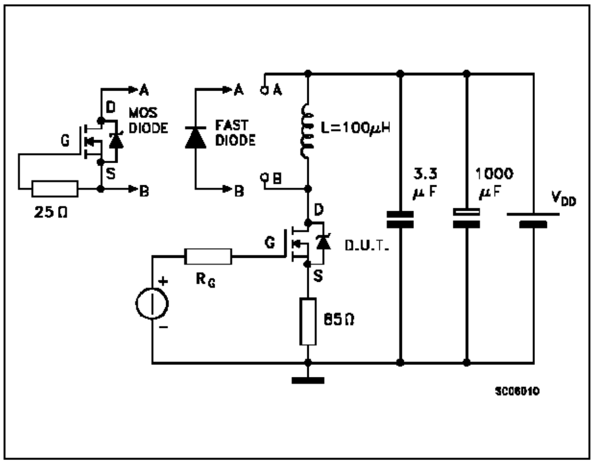
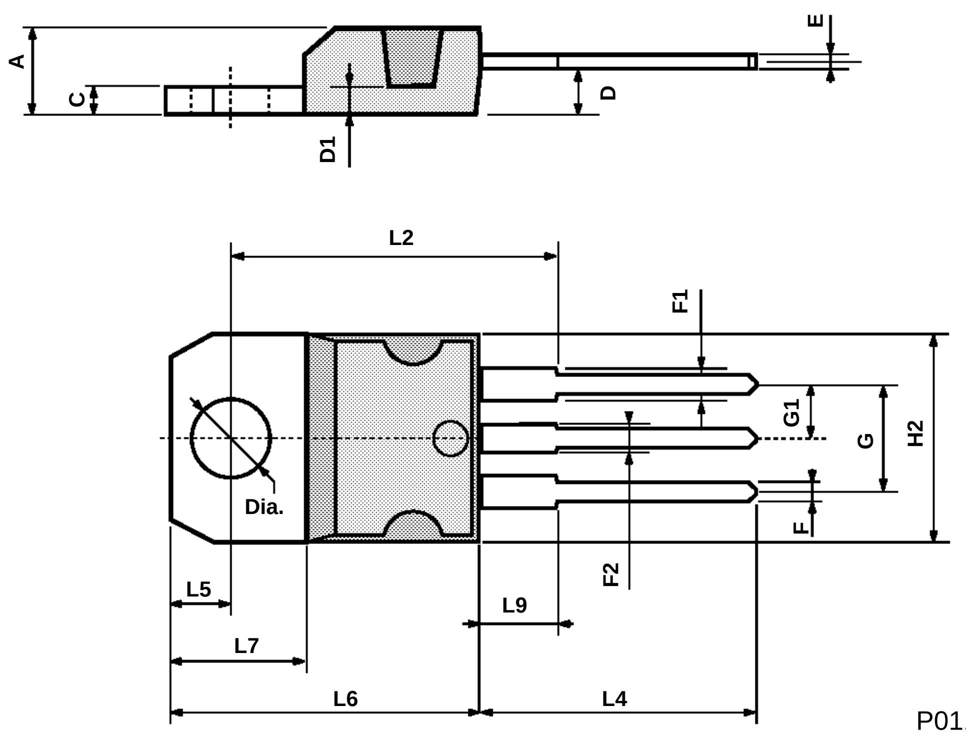


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time



TO-220 MECHANICAL DATA

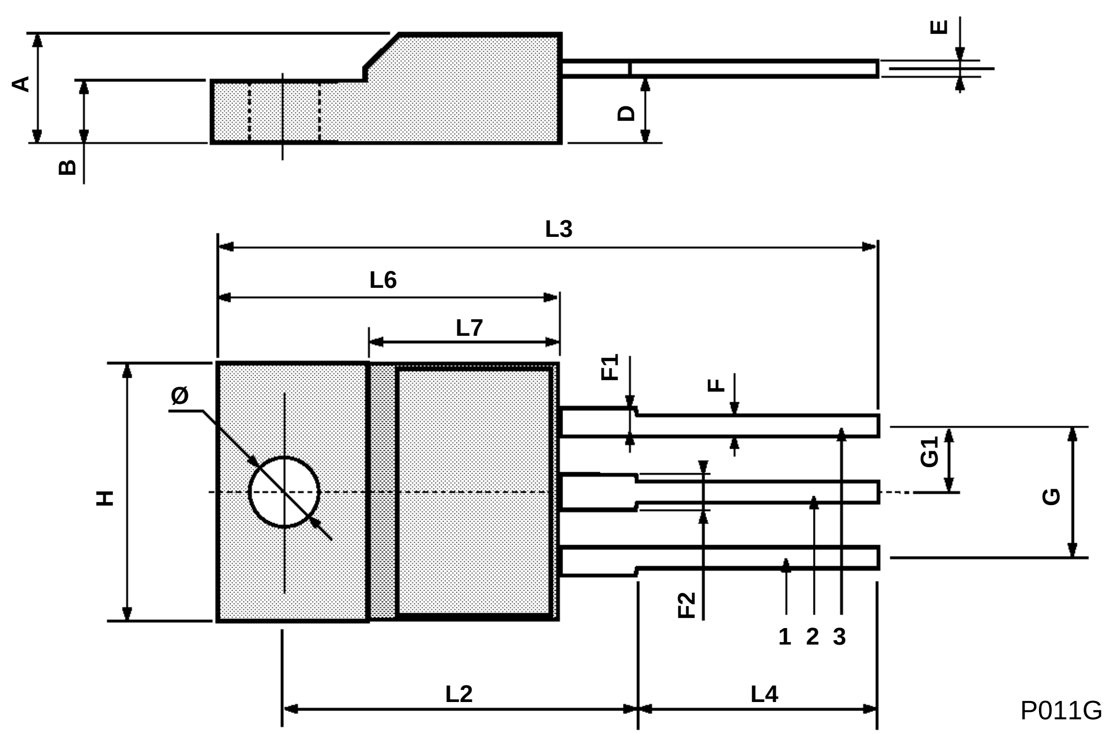
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.40		4.60	0.173		0.181
C	1.23		1.32	0.048		0.051
D	2.40		2.72	0.094		0.107
D1		1.27			0.050	
E	0.49		0.70	0.019		0.027
F	0.61		0.88	0.024		0.034
F1	1.14		1.70	0.044		0.067
F2	1.14		1.70	0.044		0.067
G	4.95		5.15	0.194		0.203
G1	2.4		2.7	0.094		0.106
H2	10.0		10.40	0.393		0.409
L2		16.4			0.645	
L4	13.0		14.0	0.511		0.551
L5	2.65		2.95	0.104		0.116
L6	15.25		15.75	0.600		0.620
L7	6.2		6.6	0.244		0.260
L9	3.5		3.93	0.137		0.154
DIA.	3.75		3.85	0.147		0.151



P011C

ISOWATT220 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
B	2.5		2.7	0.098		0.106
D	2.5		2.75	0.098		0.108
E	0.4		0.7	0.015		0.027
F	0.75		1	0.030		0.039
F1	1.15		1.7	0.045		0.067
F2	1.15		1.7	0.045		0.067
G	4.95		5.2	0.195		0.204
G1	2.4		2.7	0.094		0.106
H	10		10.4	0.393		0.409
L2		16			0.630	
L3	28.6		30.6	1.126		1.204
L4	9.8		10.6	0.385		0.417
L6	15.9		16.4	0.626		0.645
L7	9		9.3	0.354		0.366
Ø	3		3.2	0.118		0.126



P011G